What is claimed is:

1. An objective lens for converging a beam emitted by a light source on a recording surface of an optical disc, having compatibility with at least two types of optical discs of different data densities by employing a diffracting structure having annular zones formed on at least one surface of the objective lens,

the surface on which the diffracting structure is formed including:

an inner area which focuses the beam on the recording surface of each optical disc substantially with no aberration both when a first beam of a first wavelength for information recording/readout of a first optical disc is incident thereon and when a second beam of a second wavelength for information recording/readout of a second optical disc having data density relatively higher than that of the first optical disc is incident thereon; and

an outer area which focuses the second beam on the recording surface of the second optical disc substantially with no aberration while forming a wavefront that is substantially continuous with a wavefront of part of the second beam that passed through the inner area,

wherein the outer area includes at least one first annular zone which is formed so that part of the first beam that passed through the first annular zone will be substantially in antiphase with part of the first beam that passed through the inner area,

wherein a convergence angle θ [deg] of part of the first beam incident on the outermost part of the inner area measured after emerging from the objective lens and a design numerical aperture NA_{ref} as an NA (Numerical Aperture) necessary for the information recording/readout of the first optical disc satisfy:

$$1.0 < \sin\theta/NA_{ref} < 1.1,$$ and

wherein an effective NA of the objective lens for the first beam is substantially equal to the numerical aperture NA_{ref}.

2. The objective lens according to claim 1, wherein phase difference ϕ [deg] between the phase of the part of the first beam that passed through the first annular zone and the phase of the part of the first beam that passed through the inner area satisfies one of the following conditions:

$$-180° \leq \phi < -90°,$$ and

$$+90° < \phi \leq +180°.$$

3. The objective lens according to claim 2, wherein the phase difference ϕ further satisfies one of the following conditions:

$$-180° \leq \phi \leq -120°,$$

$$+120° \leq \phi \leq +180°.$$

4. The objective lens according to claim 1, wherein a diameter W1 of a beam spot formed on the recording surface of the first optical disc by the first beam that passed through the objective

lens and a beam spot diameter W_{ref} obtained when an objective lens having an NA equal to the design numerical aperture NA_{ref} is used satisfy:

$$0.99 < W1/W_{ref} < 1.01.$$

5. The objective lens according to claim 1, wherein at least one of the first annular zones is formed in the vicinity of the boundary between the inner area and the outer area.

6. The objective lens according to claim 1, wherein the outer area includes a second annular zone which is formed in the vicinity of the periphery of the outer area so that part of the first beam that passed through the second annular zone will be substantially in phase with part of the first beam that passed through the inner area.

7. An objective lens for converging a beam emitted by a light source on a recording surface of an optical disc, having compatibility with at least two types of optical discs of different data densities by employing diffracting structure having annular zones formed on at least one surface of the objective lens,

the surface on which the diffracting structure is formed including:

an inner area which focuses the beam on the recording surface of each optical disc substantially with no aberration both when

a first beam of a first wavelength suitable for information recording/readout of a first optical disc is incident thereon and when a second beam of a second wavelength suitable for information recording/readout of a second optical disc having data density relatively higher than that of the first optical disc is incident thereon; and

an outer area which focuses the second beam on the recording surface of the second optical disc substantially with no aberration while forming a wavefront that is substantially continuous with a wavefront of part of the second beam that passed through the inner area,

wherein the objective lens is placed so that the first beam will be incident thereon as a parallel beam,

wherein the outer area includes at least one first annular zone which is formed so that part of the first beam that passed through the first annular zone will be substantially in antiphase with part of the first beam that passed through the inner area,

wherein focal length f1 of the objective lens for the first wavelength, height H of the outermost part of the inner area measured from the optical axis of the objective lens, and a design numerical aperture NA_{ref} as an NA (Numerical Aperture) necessary for the information recording/readout of the first optical disc satisfy:

$$1.0 < H/(f1 \cdot NA_{ref}) < 1.1,$$ and

wherein an effective NA of the objective lens for the first beam is substantially equal to the design numerical aperture NA_{ref}.

8. The objective lens according to claim 7, wherein phase difference ϕ [deg] between the phase of the part of the first beam that passed through the first annular zone and the phase of the part of the first beam that passed through the inner area satisfies one of the following conditions:

$-180° \le \phi < -90°$, and

$+90° < \phi \le +180°$.

9. The objective lens according to claim 8, wherein the phase difference ϕ further satisfies one of the following conditions:

$-180° \le \phi \le -120°$, and

$+120° \le \phi \le +180°$.

10. The objective lens according to claim 7, wherein a diameter W1 of a beam spot formed on the recording surface of the first optical disc by the first beam that passed through the objective lens and a beam spot diameter W_{ref} obtained when an objective lens having an NA equal to the design numerical aperture NA_{ref} is used satisfy:

$0.99 < W1/W_{ref} < 1.01$.

11. The objective lens according to claim 7, wherein at least one of the first annular zones is formed in the vicinity of the boundary between the inner area and the outer area.

12. The objective lens according to claim 7, wherein the outer area includes a second annular zone which is formed in the vicinity of the periphery of the outer area so that part of the first beam that passed through the second annular zone will be substantially in phase with part of the first beam that passed through the inner area.